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ABSTRACT

A case study documented a continuous quality improvement approach to school improvement in a rural Nebraska high school over a 2-year period. Data gathered from surveys, portfolios, pilot results, and test scores indicated that the changes during the 2-year period were not dramatic, but significant and consistent with the Total Quality literature. This literature indicates that the commitment to quality must be in place for the long term to see improvement in the organization's ability to meet and exceed the customers' expectations. Specifically, a clearly defined vision and mission for the school was developed and implemented, and a comprehensive system of student learning outcomes with clearly defined assessments and an articulated technology plan was developed. There were significant improvements in student satisfaction with the purpose and direction of the instruction they received; books, materials, and technology provided in the classroom; and teacher fairness. Both general and special education students improved their performance after implementation of a student staff support program designed to assist students who were most at risk for poor behavior and academic achievement. A pilot advisor-advisee program contributed to a decline in failures and near-failures among the target group of eighth-grade students and received positive responses from surveyed parents. A refined detention system resulted in higher levels of compliance and greater satisfaction among faculty. Implications for school improvement are discussed. (TD)

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Continuous Quality Improvement: A Roadmap for Rural School Improvement

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Paper presented at the Annual Meeting of the National Rural Education Association (Charleston, SC, October 28, 2000).

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Continuous Quality Improvement: A Roadmap for Rural School Improvement

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"We shape our buildings; thereafter, they shape us."
Winston Churchill –1960

The 21st Century marketplace places high value on employees who are adaptable, flexible and able to learn new skills to fit new job expectations; the traditional high school places value on conformity and acquisition of static knowledge bases. Transforming the secondary school, whether rural, urban or suburban, is a tricky and risky proposition. Today's comprehensive high school is organized, traditionally, like the assembly lines of the industrial revolution. The building is usually large, with blocks of cube shaped rooms connected by long hallways. The workers (students) and their managers (teachers) are isolated from other workers and the rest of the management team. Their work time is organized into blocks of six, seven, or eight periods, straight block four periods, alternating block four or countless other configurations set by the clock, lunch schedules, bus schedules and other internal needs. The workers' stations are in rows and columns, again designed to isolate the workers from each other. The manager's station is positioned to maximize visual control and to focus attention on the center of activity - him or her.

Changing the traditional, industrial age high school model from a place where the mission is to process students through a series of educational experiences and sort and separate them into ability and performance groups, to one where the mission is to identify and meet specific customer needs cannot be achieved by tinkering. Simply adapting the same industrial age based assembly line paradigms that have dominated secondary school management and structure for the past ninety years have not effectively transformed the organization. The Total Quality revolution, the application of the Total Quality Management (TQM) principles espoused by W. Edwards Deming,

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gave birth to a new paradigm in manufacturing and service industries across the globe. Secondary education is in dire need of the same transformation.

The purpose for conducting this study was to determine if TQM tools and principles would be effective in redirecting a comprehensive public school improvement process. The school district's administrative team was given the latitude by the State Nebraska Department of Education to develop a new, site-based model for the process of conducting the comprehensive review of district performance and developing interventions to improve performance. The school leaders and the strategic planning team felt that a continuous improvement process model would create more positive change, in the short term and long term, than the traditional seven year review.

The Total Quality Revolution

The Continuous Quality Improvement (CQI) philosophy and practice that grew out of the business applications for TQM seem to have utility in improving a public sector organization. As, Robert W. Galvin, former CEO of Motorola Inc. stated, "The recurring question in our society is, 'How do we become more competitive?' A good surrogate question is, 'What are you doing about quality?' The fundamental answer is we must become competitive one person at a time. Quality is a personal responsibility" (Yearout, 1996, p.51).

Though critics of the comprehensive high school call for changes, the path of educational reform is littered with the remnants of many theories, fads and programs. As Bradley (1993) stated in his book on educational TQM applications, "What education has long needed is a tangible definition of how to measure a school's educational program. Terminology and movements such as excellence, reform or improvement have been dependent on arbitrary measures such as norm referenced test scores, attendance percentages, drop out rates or similar

methods that are controversial." There are other models to consider. There are systems in the healthcare, manufacturing and service industries that can be utilized in the complex business of school improvement.

The Change Process

Comprehensive high schools need to change for three basic reasons according to Lezotte (1993):

1. They need to change because our society is changing in so many ways.
2. They need to change because the nation's expectations for the schools have changed.
3. Schools need to change because the population of the public schools is changing dramatically. (Lezotte, 1993. p. 22)

The expectations that we place on our consumer services, health care providers and the companies that manufacture the products we use every day are no different than those we place on public education. The philosophies of Deming, Juran, and Crosby have been adapted across these industries for one critical purpose: to continually meet and exceed the needs and expectations of the customers at a price they are willing to pay. The public expects the highest quality education to be provided for students at the best price. To provide this level of service, educators may wish to adopt the Continuous Quality Improvement systems thinking models that have proven to be successful in business organizations as diverse as Xerox, Ford Motors, General Motors, Federal Express, Florida Power and Light. Schools have also adapted the CQI systems approach to improvement. The Pinellas County (Florida) Schools won the 1998 Florida Quality Award and was ranked number one in the state in student performance. (Siegel, 2000, p.66)

The new information ages industries, the world of "dot com," provide yet other models of organization. Many of these companies operate in a cyber world owning no tangible property,

producing no tangible product, yet commanding increasing attention and money from small and large investors. These loosely coupled organizations have very fluid structures designed to strike with lightning swiftness to meet market demands. These workers do not necessarily complete their tasks set in physical work station in a configuration of rows and columns of desks. Work groups and managers are not physically and functionally separated from each other. Instead, the campus style work places of Microsoft and other information companies encourage informal fluid collaboration in workspaces that resemble a college campus - or home.

The students graduating from high school in the new millennium will probably work in companies not yet formed in places not yet designed. Will they prepare for this workplace in a large school building containing connected boxes, isolated from the industry and business of the community, studying a curriculum largely adapted from medieval studies? Or will they explore, study, share and hone their skills in a different type of structure in a different type of instructional process?

Response To the Marketplace

The "New Philosophy" that Deming and other quality theorists refer to has implications for education. According to Leonard it is, " Learning and applying the system of profound knowledge in order to understand the statistical nature of work and learning; view work and learning as dynamic processes, take appropriate action to accomplish improvement; because in this new economic age, there is and can be no such thing as good enough." (Leonard, 1992, p. 18)

The key elements of the continuous quality improvement model that have evolved from the New Philosophy are:

1. Long-term thinking and behavior, leadership obsessed with quality and consistent investments in training.

2. Elimination of barriers to continuous improvement and to pride in workmanship and joy of learning.
3. Congruent interest in teamwork and willingness to accept responsibility for improvement. (Leonard, 1992, p. 20)

School leaders need to carefully consider whether the rural school and/or school district are ready for a total quality culture. According to Bradley (1993), "The truth is, TQM isn't right for every school district. And whether it can be used to improve a district depends in large part on the mind set of the board." (p. 28) For the school districts that are ready to systematically improve, "To TQM advocates, innovation isn't something you do only when you identify some deficiency, it's constant and it's necessary if a district is to pursue continuous improvement." (p. 29) Experts speculate that most problems in schools (and any organization) are systems problems and that 85% of these problems are caused by and must be solved by management. Not all school leaders are ready to accept that position.

Quality Planning

A " Quality" school organization must dedicate itself to appropriate planning and goal setting processes that precede the commitment to and implementation of TQM. "TQM demands clear organizational goals, the framework for contractual performance expectations for effective employee performance and standards of quality that aim to satisfy customers." (Bond, 1993, p. 26) Other requirements will include commitment to high employee morale and staff involvement in decision making. They will have to satisfy diverse constituencies and still do a first-rate job of educating students.

The mission of this "Quality " school organization must evolve from the requirements and expectations of the customers. The "Big Three" customers of the public schools, the military,

higher education and the work place, are the same ones the public schools have supplied for the past one hundred years. Their expectations have, however, changed dramatically.

Research Design

This research study was conducted as a case study in a rural high school over a two-year period. It documented an approach to school improvement to systematically improve the curriculum, curriculum/technology integration and school climate. The study conducted on the school improvement process was designed to utilize a mixed method design. The data for this study were collected through the use of surveys and other quality data collection devices after the implementation of a Continuous Quality Improvement system for the school district. The study of the application of Continuous Quality Improvement management principles and tools to guide the improvement process required a combination of measures to be used to evaluate the effectiveness of improvement interventions.

These quality measures were also used to track the organization's performance in meeting its objectives over time. The school improvement process interventions included the design of subject area learning outcomes and benchmark assessments and selection of appropriate materials, texts and learning technology; to improve school climate; and to develop a technology implementation plan and integrate technology into the curriculum.

The following table illustrates the system of quality improvement interventions and the measures used to track them.

Table 1

Measures of Improvement

Intervention	Measure	Data
1. Improve Classroom Experience	Survey Data	Nominal
2. Technology Integration (Student)	Survey Data	Nominal
3. Technology Integration (Teacher)	Portfolio Data	Nominal
4. Improve Climate	Pilot Results	Interval
5. Learning Assessment	Test Results	Interval

Initial Data Collection

The initial base line data collection process was designed by the administrative team of the school district based on the High Performance Learning model promoted by the Nebraska State Dept of Education. A Strategic Planning process was started in August of 1993 using a steering committee made up of 29 community members, parents, staff and administrators. These groups developed a mission statement and set up eight action planning task forces, designed to address deficiencies identified in the data collection process. In addition, the Board of Education was informed that a Total Quality Management strategy (Continuous Quality Improvement) would be used to guide the school improvement process. The Board adopted the mission statement and accompanying briefs in January of 1994.

Instruments and Methods

A variety of total quality assessment tools were used to monitor progress and effectiveness of interventions developed from the improvement goals. In addition, quantitative data were reported from a survey on student satisfaction. These trend study assessments provided a

"snapshot in time" to determine if the action plans were working in the global picture of the organization.

The research questions that guided the study were:

1. Will there be improvement in the level of student satisfaction with classroom experiences across a wide variety of demographic groups after the implementation of CQI school improvement initiatives?
2. Will the data collected on school climate initiatives reflect successful implementation of CQI improvement initiatives?
3. Will the data collected on the technology plan initiatives reflect successful implementation of CQI improvement initiatives?
4. Will the data collected on the development of learning outcomes, benchmark assessments and new curriculum reflect successful implementation of CQI improvement initiatives?

Multiple methods were used to assess the effectiveness of the school improvement projects over a two-year period of time. The CQI project results measured only those systems that were targeted for improvement by the School Improvement Plan utilizing appropriate Total Quality Management processes and tools. The process of implementing the CQI systems was measured using data from selected improvement projects and a survey of Student Satisfaction. The intent of a CQI systems approach is to invest resources, collect data, identify needed system changes, and implement interventions to meet organizational goals and to monitor the interventions' effects. This is, according to the literature, a long-term commitment to change. The changes may not result in dramatic changes but should produce incremental change within the organization.

Findings

The analysis of the data revealed several important improvements to the system. A clearly defined vision and mission for the district and high school was developed and implemented. A comprehensive system of student learning outcomes with clearly defined assessments and an articulated technology plan were developed for the elementary and secondary programs. In addition, there were significant improvements in student satisfaction in the classroom.

Research Question 1 – The organization sought to determine if the CQI Improvement interventions developed to improve the level of satisfaction of the customer (student) with classroom experiences and their relationships with the teachers. Students who were surveyed using the Survey of Student Satisfaction (grades 7-9 in 1995/ grades 10-12 in 1997) reported that they had a clearer idea of the purpose and direction of the instruction they received from 1995 to 1997. During that time frame, a variety of changes were made in the core curriculum and the benchmark assessments used to gauge student achievement. Teachers also made extensive efforts to integrate technology into regular classroom instruction. Table 2 illustrates the slightly higher level of satisfaction with the clarity of goals and objectives ("4" representing strong agreement):

Table 2

Student Satisfaction Survey - Teacher Clarification Data

Survey Year	Mean	Std. Deviation	N
1995	3.40	.67	153
1997	3.53	.59	166

Coupled with the improvement in the clarity of instruction was improvement in the Survey of Student Satisfaction subscale scores for Teacher Provided Materials. Students were surveyed

about the books, materials and technology provided in the classroom. New texts were provided in only 25% of the core subject classrooms but there was considerable capital investment in technology and student access to technology increased. The slightly higher level of satisfaction is illustrated in Table 3.

Table 3

Student Satisfaction Survey -Teacher Provided Materials

Survey Year	Mean	Std. Deviation	N
1995	3.34	.76	153
1997	3.49	.64	166

In addition, a surprising fact was revealed in the analysis of variance between grade 10 respondents from 1995 and their peers in grade 7, 8 and 9 on the Teacher Interest and Teacher Fairness subscales on the Survey of Student Satisfaction. The variance (grade 10 respondents were far more negative in the 1995 survey) was reduced after two years. One of the key principles of Total Quality management systems approach is to reduce unintended variance in systems and this was an unexpected positive result.

The variance in the responses by the grade 10 group compared to the same group two years later in grade 12 are illustrated in these of Analysis of Variance (tables 4 and 5).

Table 4

Analysis of Variance 1995 - Teacher Interest Grades 7-10

Source 1995	df	Sum Sq.	Mean Sq.	F Ratio	F Prob.
Between Gr.	3	10.6037	3.5346	8.9799*	.0000
Within Gr.	149	58.6475	.3935		

Group	N	Mean	St. Dev.	St. Error
Seven	30	3.7111	.4992	.0911
Eight	33	3.5364	.7933	.1381
Nine	52	3.5736	.5209	.0722
Ten	38	3.0052	.6750	.0546
TOTAL	153	3.413	.6750	.0546

Significant *p< .05

Table 5

Analysis of Variance 1997- Teacher Interest Grades 9-12

Source 1995	df	Sum Sq.	Mean Sq.	F Ratio	F Prob.
Between Gr.	3	.1663	.0554	.1545	.9266
Within Gr.	162	58.1127	.3587		

Group	N	Mean	St. Dev.	St. Error
Nine	47	3.5061	.5083	.0741
Ten	56	3.5393	.6538	.0874
Eleven	40	3.5688	.5239	.0828
Twelve	23	3.4727	.7389	.1541
TOTAL	166	3.5278	.5943	.0461

These data confirm that the combination of interventions designed to improve classroom experience and teacher/student relationships brought the "out of statistical control" 1995 tenth

graders to a point where they were not statistically different from their peers in grade 9, 10 and 11 in 1997.

Research Question 2 - Elements of the Climate School Improvement interventions also had positive impact on students' satisfaction. Data collected on the Student Staff Support Program, an innovation to assist students who were most at risk for poor behavior and academic achievement was positive. Data revealed that those students at risk, generally representing 10-15 %of the school population who create a disproportionate share of classroom disruptions, improved their behavior and performance in the classroom as a result of provide special services and adaptations provided in the classroom. Both general education and special education students were assisted and improved their performance after 18 weeks of intervention.

Advisor Advisee Pilot

The results of the pilot Advisor-Advisee program delivered to seventh and eighth grade students also contributed to more positive results on the survey. This program contributed to a decline in failures and near failures among the target group of eighth grader and in positive responses by surveyed parents. This support system of inter-age groups led by teachers serving as advisors provided another avenue of communication between students, staff and parents. Parents also supported the program as revealed by a random phone survey.

Detention Review

Positive results were also produced with the refinement of the Detention System. This program refinement was initiated and directed by a committee of teachers. The data revealed higher levels of compliance with the refined system and greater satisfaction among the faculty with the system.

Research Question 3 - The third part of the School Improvement Plan was the development and implementation of a Technology Plan. This plan process produced learning outcomes for students at all levels of the system. In addition, a system of software and hardware recommendations for purchase and integration into the curriculum was created and implemented. Training was delivered to staff individually and in small groups. On the administrative side, new applications for student information systems was researched and purchased.

The net result was that student survey data revealed a substantial increase in satisfaction for access to and use of technology. Staff members documented their progress in integrating technology into the classroom by providing samples of students and teacher work in summative evaluation portfolios.

Research Question 4 - The final goal of the School Improvement plan was to develop a curriculum guide that clearly defined the learning outcomes for each curricular area. A process of systematic curriculum and best practice review, a system for selection of materials and texts and a system of benchmark assessments were created over the life of the plan. The assessment system was created with consideration for the ability level of each group with the emphasis being placed on students performing at their level of ability on norm- referenced measures.

Data indicated that the level of student satisfaction with instruction in science and social studies was higher after the revision of the curriculums (K-12). Preliminary California Test of Basic Skills (CTB) achievement test scores in science and social studies in grades eight and ten were commensurate with the cognitive ability levels in each grade level except one as illustrated in Table 6 and 7.

Table 6

CTB Median National Percentage - Science

Grade Level	CTB Percentage Group	CTB Cog. Abilities
8	70.0	66.0
10	82.7	82.0

Table 7

CTB Median National Percentage - Soc. Studies

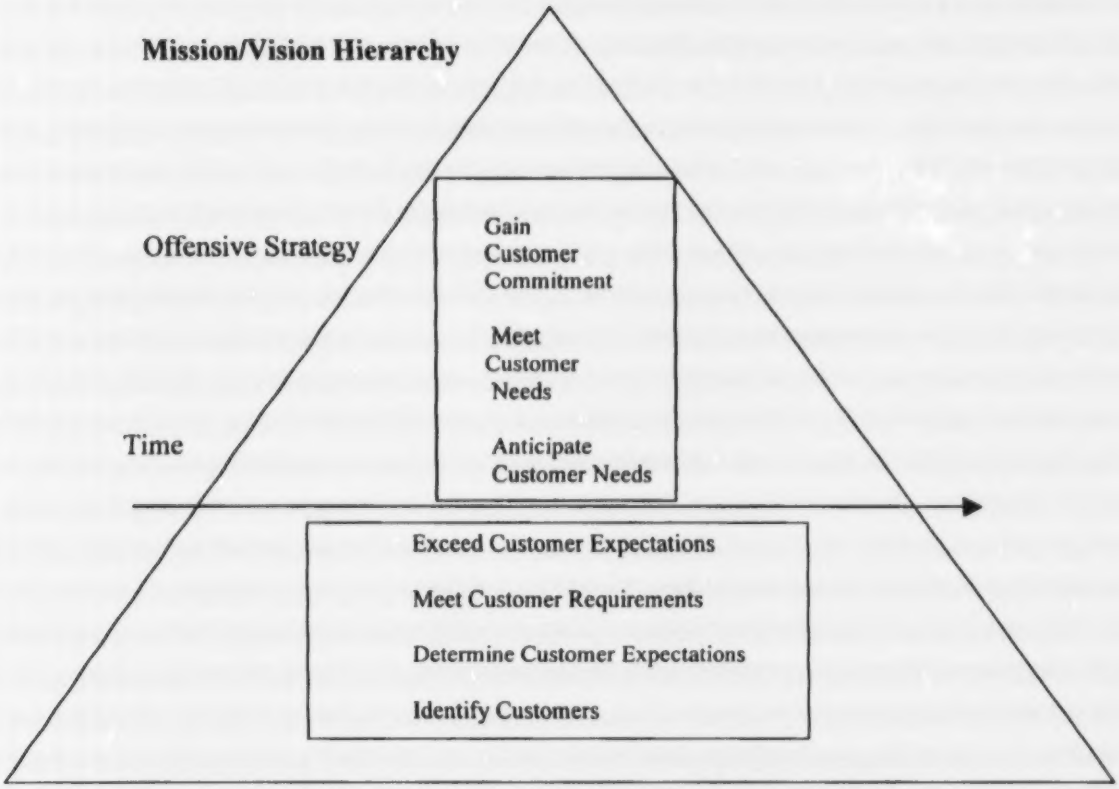
Grade Level	CTB Percentage Group	CTB Cog. Abilities
8	65.2	66.0
10	70.7	82.0

In addition, the data from the benchmark assessment system developed in each content area was positive. The percentage of students successfully completing these assessments was 95% or above for each content area and grade levels tested.

The Quality Transformation

School leaders need to take a "market analysis" view of setting the vision and mission of the school. The development of strategies to carry out that mission can be represented by a mission hierarchy. This graphic illustrates the defensive (reactive planning) and offensive (proactive planning) strategies (Figure 1).

Figure 1



Many quality initiatives in the business world do not succeed (reaching Level 7) because of a lack of focus on the customer and too much attention being paid to internal operations. Research completed on Global 1000 corporations revealed, "We have concluded that most companies' quality initiatives focus primarily on internal processes that are rarely linked to desirable business results (Howe & Greddart, 1992, p. 12). In contrast, "Successful quality

initiatives invariably formulate mission statements that are focused externally on their customers rather than internally on their processes or objectives" (Howe & Greddart, 1992, p.37).

The same recommendation could be made to rural high school leaders interested in transforming their schools into "Quality Organizations." The rural high school is a small organization with a relatively flat administrative (management) structure. It has close ties to the community and its needs. It is increasingly linked electronically to the world with local and wide area computer networks and it has traditionally met the needs of the Big Three customers. Companies, colleges and the military like the work ethic and skill base rural graduates bring to them and recruit them hard. While they do not often have experience with diverse populations, they have the desire to learn from others and grow.

In addition, the rural school has long expanded the walls of the school out into the world. Industrial technology, biology, mathematics, and business administration are natural elements of agricultural operations and the related industries that support it. Students apply their skills in these organizations at an early age because they are valuable members of the work force in these communities. What school leaders need to do now is modify the delivery and assessment systems within the school walls, reengineer the building (s) that house the system and empower the administrative and teaching staff to create changes in the curriculum.

Students can now easily access information in traditional libraries and countless other sources on the World Wide Web. They can converse and share in real time video, e-mail, and distance learning systems with the experts in a wide variety of fields of learning and peers alike. They can, in essence, operate much like the employees of the dot.com company linking with in house experts (teachers) and outside resources in new ways. They will be able to complete these learning/work tasks if they have the right technical and human support.

Teachers and administrators will need to set up and monitor continuous quality improvement systems of teaching and assessing that will produce the results that their customers want. They will need to provide the personnel, learning materials and technology to enhance student performance.

Implications

The result of this study revealed that the systematic application of CQI processes could result in a "kaizen" type (a thousand one percent improvements) pattern of improvement. While the changes in a two-year period in school climate were not dramatic, they were consistent with the Total Quality literature, which indicated that the commitment to quality must be in place of the long term to see the improvement in the organization's ability to meet and exceed the customers' expectations.

As schools chart their courses and rewrite their missions for the 21st Century, the comprehensive high school will be transformed – or it will fail. Rapid changes in information technology have changed the American workplace; school leaders must also change the "school place." Instead of long halls of isolated cubes, the modern high school may take on the look of a Microsoft style campus. Work groups of students, under the supervision of teacher/facilitators, will use their computer workstations as an extension of normal everyday problem solving. Flexible groups for instruction, mentoring, experimentation, creating and assessment will be formed in the classrooms or work areas.

The world outside the school will become the laboratory for learning and integrating new skills. Students and teachers will have greater satisfaction in their learning/working experiences, and as a result, student achievement will increase. The people who purchase goods and services have much higher quality expectations for the performance of these goods and services today.

Public schools will have to meet these expectations or the customers will take their dollars to other schools that will meet those expectations.

One of the most resilient and yet resistant institutions of American life is the rural public high school. Trophy cases harbor the glories of athletic feats past and school calendars mark the traditions of youth's transition into adulthood such as the prom, homecoming and commencement. The high school stands as the symbol of community stability. It is the institution that is charged with preparing youth for their lives as parents, citizens, workers, volunteers and caretakers of the culture's traditions.

The physical structure of the traditional rural high school, with its assembly line design, does not necessarily have to shape the lives of the students and teachers within it as Churchill surmised. However, the thinking of the occupants will have to be shaped by the world outside of its walls. The teachers and students will have to be obsessed with finding better and more efficient ways of carrying out the tasks of learning. They will be shaped by the ever-changing needs of the customers they serve.

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